

## CLAIMS

What is claimed is:

1. A method for providing animation to a target head model, the method comprising the steps of:

5       receiving target head image data including a plurality of target head vertices data including a location data for each of the plurality of head vertices data;

10       providing standard head image data including a plurality of standard head vertices data including a location data for each of the plurality of standard head vertices data;

15       associating a plurality of standard head marker locations on the standard head model to a corresponding one of a plurality of target head marker locations on the target head model, wherein each standard head marker is one of a subset of the plurality of standard head vertices data, and each target head marker is one of a subset of the plurality of standard head vertices data;

20       determining a transformation for morphing the standard head to the target head, wherein the morphing function is determined using a least squares optimization function of a preselected norm of the difference between a predetermined function of the subset of the plurality of standard head vertices data and the corresponding

25       subset of the plurality of target head vertices data;

      providing an expression vector including expression image data corresponding one or more images corresponding

to an expression to be displayed on the standard head;  
and

5 determining a target expression vector including  
target expression image data as a function of the  
morphing function and the expression data, wherein the  
target expression image data is displayable on the target  
face.

10 2. The method of claim 1 further including the step of  
displaying the target first image data.

3. The method of step 1 wherein the preselected norm is  
a Euclidean norm.

15 4. The method of step 1 wherein the preselected norm is  
the sum of the squares of the predetermined function and  
the subset of the plurality of target head vertices.

20 5. The method of step 1 wherein the preselected  
function is a polynomial.

6. The method of step 1 wherein the preselected  
function is a NURBS.

25 7. The method of step 1 wherein the preselected  
function is a rational polynomial.

8. The method of step 8 wherein the rational  
polynomial is a Chebychev polynomial.

9. The method of step 1 wherein preselected function is an expansion or trigonometric functions.

5 10. The method of step 1 wherein preselected function is an expansion of exponential functions.

11. The method of claim 1 wherein the step of determining a target expression matrix includes:

10 transforming the plurality of standard expression vertices data into a plurality of target expression vertices data by applying the predetermined function to the plurality of standard expression vertices data.

15 12. The method of claim 1 wherein the standard head image data includes a standard head basis matrix and a standard head mean value and wherein the expression matrix includes a standard expression basis matrix and a plurality of animation vectors that when multiplied by  
20 the standard expression basis matrix provides the standard expression image data, the step of determining a target expression matrix includes:

transforming the standard head basis into a target head basis matrix by applying the predetermined function  
25 to the standard basis matrix;

subtracting the standard head mean value from the target head basis matrix forming a modified target head basis matrix;

multiplying the modified target head basis by at least one animation vector to provide target expression image data.

5 13. A method for providing target expression image data for use with a target head image data model, wherein the expression image data corresponds to one or more images corresponding to an expression to be displayed on a standard head, wherein said expression image data  
10 includes a plurality of expression vertices data including a location data for each of the plurality of expression vertices data, wherein the standard head image data includes a plurality of standard head vertices data including a location data for each of the plurality of  
15 standard head vertices data, wherein the standard head image data is anthropomorphically mapped into the target head image data model, the method comprising the steps of:

providing the target head image data including a  
20 plurality of target head vertices data including a location data for each of the plurality of head vertices data;

associating each of a subset of the plurality of  
target head vertices data with a corresponding one of the  
25 plurality of standard head vertices data;

determining a transformation to transform the surface and features of the standard head to the surface and features of the target head, wherein the transformation is determined using a least squares

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optimization function of a preselected norm of the  
difference between a predetermined function of the subset  
of the plurality of standard head vertices data and the  
corresponding subset of the plurality of target head  
5 vertices data;

providing a plurality of target expression image  
data as a function of the warping function and the  
standard expression image data, wherein the target  
expression image data is displayable on the target face;

10 providing a mask to insert a predetermined portion  
of the target emotion image data into the first head  
image data; and

creating a target head expression image data by  
inserting the predetermined portion of the target  
15 expression image data into the target head image data  
using the mask.

14. The method of step 13 wherein the target image data  
and the target expression matrix are provided on computer  
20 readable medium.

15. The method of step 14, wherein the computer readable  
medium is a magnetic disk.

25 16. The method of step 14, wherein the computer readable  
medium is an optical disk.

17. The method of step 14, wherein the computer readable  
medium is a CD ROM.

18. The method of step 14, wherein the computer readable medium is a DVD disk.

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